Technology Coupling for a Large TCE Plume Using a Subgrade Biogeochemical Reactor, Enhanced Phytoremediation, Biobarriers, and Enhanced Attenuation

Doug Berwick (douglas.berwick@ch2m.com) (Jacobs, Sacramento, CA, USA)
Jeff Gamlin (Jacobs, Denver, CO, USA)
Glenn Anderson and Lonnie Duke (Travis Air Force Base, CA, USA)

Background/Objectives. A novel solar-powered treatment approach, which couples four different green and sustainable (GSR) remedial technologies, is being used to treat a large trichloroethene (TCE) plume at Travis Air Force Base (AFB), California. The interim remedy at Site DP039 originally consisted of a pump and treat system, but this system was costly, unsustainable, and was not expected to achieve cleanup levels in a reasonable timeframe. An optimized exit strategy (OES) assessment was completed for this site to determine a more cost-effective, sustainable, and efficient method for treating this approximately 1,800 feet long TCE plume. Following completion of remedy optimization efforts in 2015, the final remedy consists of a subgrade biogeochemical reactor (SBGR), an enhanced phytoremediation recirculation system, an emulsified vegetable oil (EVO) biobarrier system, and enhanced attenuation (EA).

Approach/Activities. Four GSR technologies have been coupled as part of the optimized remedy at Site DP039. Treatment relies on in situ remediation and solar-powered groundwater recirculation, for a completely off-grid remediation approach. Contaminated groundwater is recirculated through the SBGR for source area treatment using solar-powered pumping. The next technology, downgradient of the source area, relies on enhanced phytoremediation. A grove of red bark eucalyptus trees has been optimized with a solar-powered groundwater recirculation system to address the central portion of the plume. The third technology, near the downgradient portion of the remedy, is an injected EVO biobarrier system. The final component of the remedy relies on EA of the distal portions of the plume.

Results/Lessons Learned. This presentation will summarize the advantages, limitations, and performance of the respective components of the coupled technologies. This will include observed concentration reductions, biogeochemical and biological indicator data, and observed first-order decay rates. This remediation approach reduced source area TCE concentrations from 8,000 micrograms per liter (µg/L) to 3.7 µg/L, while achieving a 99% total molar reduction. This optimized approach also resulted in high sustainability metrics, including a reduction of approximately 250,000 kilowatt hours per year in electrical consumption and over 90 tons per year of greenhouse gas emissions.